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(54) **TRANSFER-RESISTANT EMULSION  
CONTAINING A SURFACTANT**

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(57)

**ABSTRACT**

The present invention is directed to a transfer resistant and  
long wear composition containing: (a) at least one polyamine;  
(b) at least one oil-soluble polar modified polymer; (c) water;  
(d) at least one volatile solvent; (e) at least one non-volatile  
solvent capable of solubilizing the oil-soluble polar modified  
polymer; (e) at least one surfactant; and (f) at least one colo-  
rant.

**12 Claims, 2 Drawing Sheets**

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FIGURE 1: Creep and Recovery Compliances at Constant Stress = 10Pa for Example 1

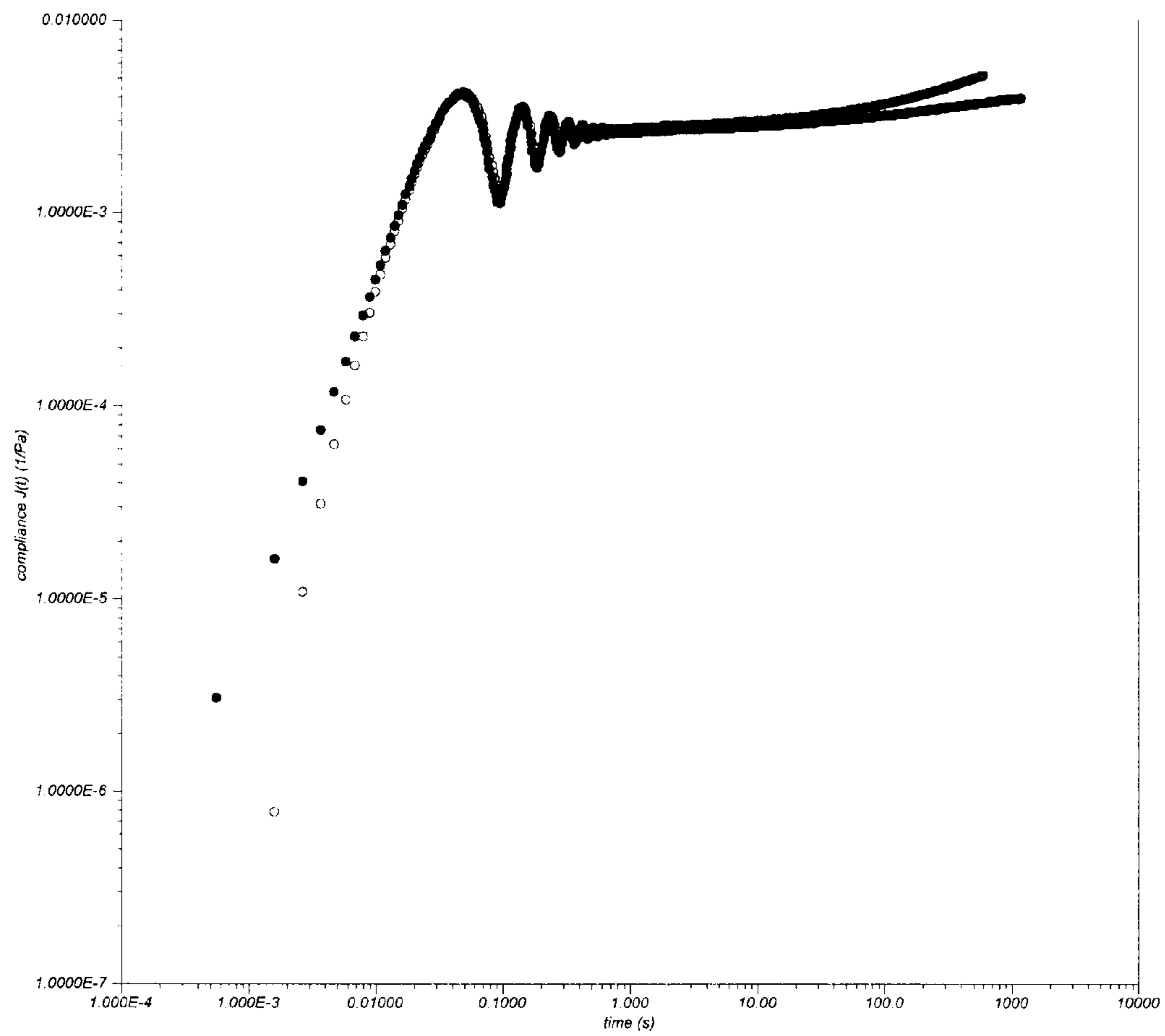
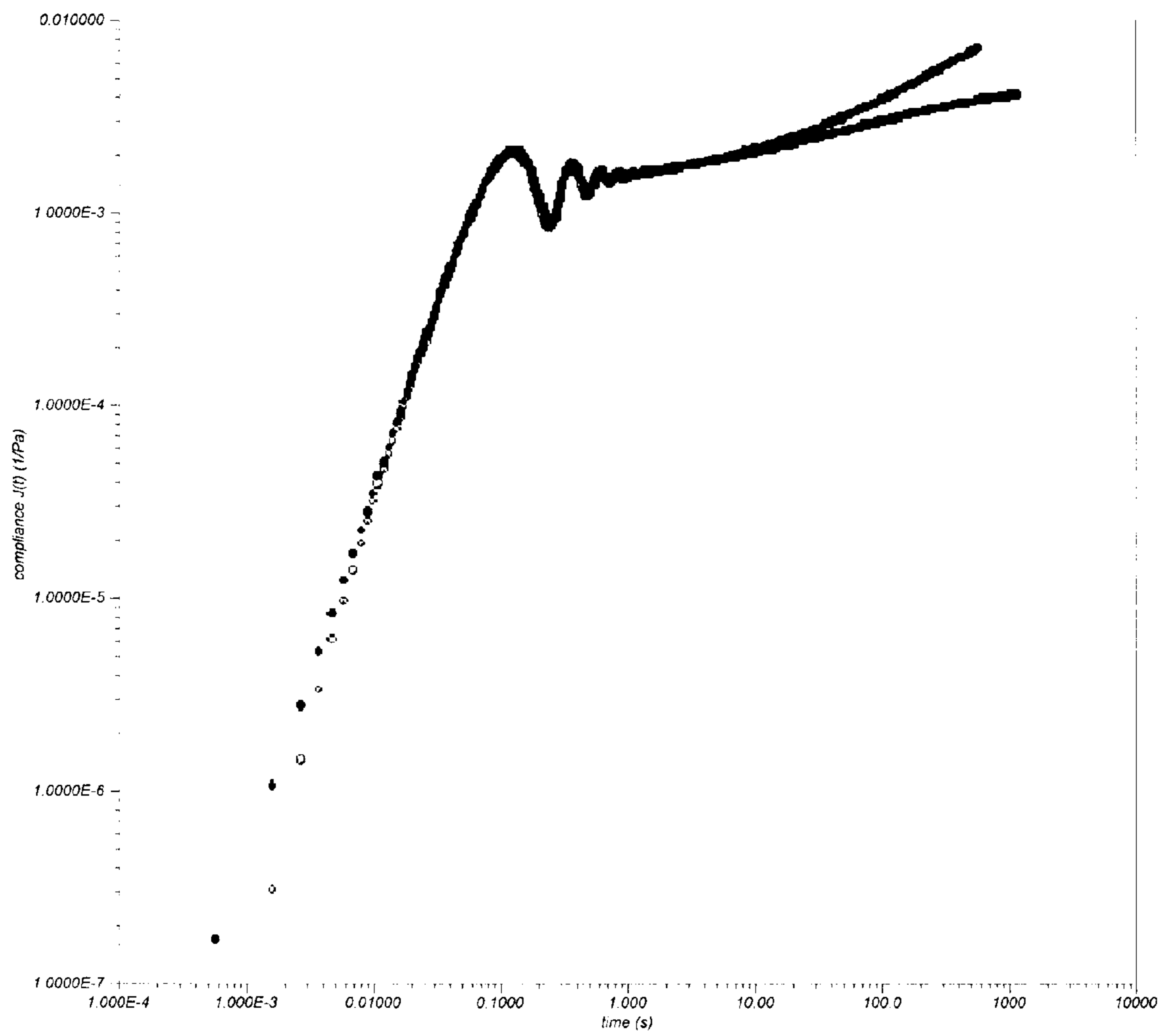


FIGURE 2: Creep and Recovery Compliances at Constant Stress = 10Pa for Example 4



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## TRANSFER-RESISTANT EMULSION CONTAINING A SURFACTANT

### FIELD OF THE INVENTION

The present invention generally relates to a colored cosmetic composition which is transfer-resistant, long wearing, with good payoff and texture. Furthermore, the present invention generally relates to a novel composition capable of possessing varying degrees of viscoelasticity. More particularly, the present invention relates to a composition that, depending on the level of volatile solvent present therein, can possess a broad spectrum of textures and feel ranging from liquid to gel-like to solid.

### DISCUSSION OF THE BACKGROUND

Many compositions, especially cosmetic compositions, have been developed for easy and comfortable application onto a targeted substrate. Unfortunately, many of these compositions are in fact difficult to apply and do not possess a smooth feel upon application. Moreover, compositions often times have a tendency to feel tacky, yielding poor application and spreadability characteristics. Similarly, the use of silicone resins to impart transfer resistance onto a colored cosmetic product suffers from the same disadvantages disclosed above.

In general, a gel-like texture is typically obtained with the use of expensive silicone elastomers which are swelled in a solvent. The present invention does not require the use of silicone elastomers in order to achieve the desired gel-like texture. Moreover, silicone elastomers can also be difficult to formulate with due to their chemical make up, and the gelled compositions they form may be unstable, as is, or sensitive to added ingredients.

Similarly, a rigid texture is typically obtained through the use of waxes and wax-like ingredients. The present invention, however, does not require the use of these types of conventionally-employed ingredients in order to formulate compositions having a rigid texture. On the contrary, essentially the same ingredients used to formulate a composition having a gel-like texture can be used to formulate one having a rigid texture. Significant cost reductions are thus realized due to the relatively inexpensive cost of the ingredients used, as well as the ease in formulating such compositions.

Therefore, it is an object of the present invention to provide a composition capable of possessing a unique texture and feel with surprising transfer resistance, long wear properties and good cosmetic pickup and payoff, without the need for having to use silicone resins, silicone elastomers or gelling agents.

### SUMMARY OF THE INVENTION

The present invention relates to a composition comprising:  
(a) a reaction product of (i) at least one polyamine with (ii) at least one oil-soluble polar modified polymer;  
(b) water;  
(c) at least one volatile solvent other than water;  
(d) at least one non-volatile solvent capable of solubilizing the oil-soluble polar modified polymer; and  
(e) at least one surfactant.

The present invention also relates to a composition comprising:

- (a) at least one polyamine;
- (b) at least one oil-soluble polar modified polymer;
- (b) water;
- (c) at least one volatile solvent other than water;

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- (d) at least one non-volatile solvent capable of solubilizing the oil-soluble polar modified polymer; and
- (e) at least one surfactant.

The present invention also relates to a composition made  
5 by combining ingredients comprising:

- (a) at least one polyamine;
- (b) at least one oil-soluble polar modified polymer;
- (b) water;
- (c) at least one volatile solvent other than water;
- 10 (d) at least one non-volatile solvent capable of solubilizing the oil-soluble polar modified polymer; and
- (e) at least one surfactant.

Preferably, the composition does not require or contain silicone resins, silicone elastomers or gelling agents, and is a transfer resistant, long wear composition having good cosmetic pickup and payoff.

The present invention also relates to a method of making up a keratinous substrate comprising applying the above-disclosed compositions onto the substrate.

It has been surprisingly discovered that the above-disclosed composition possesses a unique gel-like texture and feel, even in the absence of silicone elastomers (where the composition is free of silicone elastomer). Moreover, the inclusion of a water-soluble surfactant surprisingly enhances the pickup and payoff of the resulting product. Finally, the composition possesses transfer resistance and long wear properties.

It has been surprisingly discovered that the addition of an oil-soluble surfactant improves the payoff and texture of the foundation. It has also been surprisingly discovered that in the absence of silicone resins, the resultant product is eminently capable of forming a film with highly transfer resistant and long wearing properties.

Finally, it has also been surprisingly discovered that, depending on the amount of volatile solvent capable of forming a hydrogen bond with the reaction product present in the above-disclosed composition, the texture and feel of the composition can range from liquid to gel-like to solid, in the absence of expensive ingredients and/or processing techniques, and in a more environmentally-friendly manner. The resultant composition can be used as a stable matrix for carrying desirable ingredients to be applied in a comfortable, smooth, and easily spreadable manner.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts the creep and recover compliances at constant stress=10 Pa for Example 1.

FIG. 2 depicts the creep and recover compliances at constant stress=10 Pa for Example 4.

### DETAILED DESCRIPTION OF THE INVENTION

Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients and/or reaction conditions are to be understood as being modified in all instances by the term "about".

"Cosmetic Pickup" as used herein means amount of cosmetic product received from its given container to its given applicator.

"Cosmetic payoff" as used herein means amount of cosmetic product dispensed from its given applicator (i.e. finger, brush) onto a keratinous substrate.

"Film former" or "film forming agent" or "film forming resin" as used herein means a polymer which, after dissolution in at least one solvent (such as, for example, water and organic solvents), leaves a film on the substrate to which it is

applied, for example, once the at least one solvent evaporates, absorbs and/or dissipates on the substrate.

“Tackiness”, as used herein, refers to the adhesion between two substances. For example, the more tackiness there is between two substances, the more adhesion there is between the substances.

“Keratinous substrates”, as used herein, include but are not limited to, skin, hair and nails.

“Substituted” as used herein, means comprising at least one substituent. Non-limiting examples of substituents include atoms, such as oxygen atoms and nitrogen atoms, as well as functional groups, such as hydroxyl groups, ether groups, alkoxy groups, acyloxyalkyl groups, oxyalkylene groups, polyoxyalkylene groups, carboxylic acid groups, amine groups, acylamino groups, amide groups, halogen containing groups, ester groups, thiol groups, sulphonate groups, thiosulphate groups, siloxane groups, and polysiloxane groups. The substituent(s) may be further substituted.

As defined herein, stability is tested by placing the composition in a controlled environment chamber for 8 weeks at 25° C. In this test, the physical condition of the sample is inspected as it is placed in the chamber. The sample is then inspected again at 24 hours, 3 days, 1 week, 2 weeks, weeks and 8 weeks. At each inspection, the sample is examined for abnormalities in the composition such as phase separation if the composition is in the form of an emulsion, bending or leaning if the composition is in stick form, melting, or syneresis (or sweating). The stability is further tested by repeating the 8-week test at 37° C., 40° C., 45° C., 50° C., and under freeze-thaw conditions. A composition is considered to lack stability if in any of these tests an abnormality that impedes functioning of the composition is observed. The skilled artisan will readily recognize an abnormality that impedes functioning of a composition based on the intended application.

“Volatile”, as used herein, means having a flash point of less than about 100° C.

“Non-volatile”, as used herein, means having a flash point of greater than about 100° C.

As used herein, the expression “at least one” means one or more and thus includes individual components as well as mixtures/combinations.

Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients and/or reaction conditions are to be understood as being modified in all instances by the term “about,” meaning within 10% to 15% of the indicated number.

“Waterproof” as used herein refers to the ability to repel water and permanence with respect to water. Waterproof properties may be evaluated by any method known in the art for evaluating such properties. For example, a mascara composition may be applied to false eyelashes, which may then be placed in water for a certain amount of time, such as, for example, 20 minutes. Upon expiration of the pre-ascertained amount of time, the false eyelashes may be removed from the water and passed over a material, such as, for example, a sheet of paper. The extent of residue left on the material may then be evaluated and compared with other compositions, such as, for example, commercially available compositions. Similarly, for example, a composition may be applied to skin, and the skin may be submerged in water for a certain amount of time. The amount of composition remaining on the skin after the pre-ascertained amount of time may then be evaluated and compared. For example, a composition may be waterproof if a majority of the product is left on the wearer, e.g., eyelashes, skin, etc. In a preferred embodiment of the present invention, little or no composition is transferred from the wearer.

“Long wear” compositions as used herein, refers to compositions where color remains the same or substantially the same as at the time of application, as viewed by the naked eye, after an extended period of time. Long wear properties may be evaluated by any method known in the art for evaluating such properties. For example, long wear may be evaluated by a test involving the application of a composition to human hair, skin or lips and evaluating the color of the composition after an extended period of time. For example, the color of a composition may be evaluated immediately following application to hair, skin or lips and these characteristics may then be re-evaluated and compared after a certain amount of time. Further, these characteristics may be evaluated with respect to other compositions, such as commercially available compositions.

“Transfer resistance” as used herein refers to the quality exhibited by compositions that are not readily removed by contact with another material, such as, for example, a glass, an item of clothing or the skin, for example, when eating or drinking. Transfer resistance may be evaluated by any method known in the art for evaluating such. For example, transfer resistance of a composition may be evaluated by a “kiss” test. The “kiss” test may involve application of the composition to human keratin material such as hair, skin or lips followed by rubbing a material, for example, a sheet of paper, against the hair, skin or lips after expiration of a certain amount of time following application, such as 2 minutes after application. Similarly, transfer resistance of a composition may be evaluated by the amount of product transferred from a wearer to any other substrate, such as transfer from the hair, skin or lips of an individual to a collar when putting on clothing after the expiration of a certain amount of time following application of the composition to the hair, skin or lips. The amount of composition transferred to the substrate (e.g., collar, or paper) may then be evaluated and compared. For example, a composition may be transfer resistant if a majority of the product is left on the wearer’s hair, skin or lips. Further, the amount transferred may be compared with that transferred by other compositions, such as commercially available compositions. In a preferred embodiment of the present invention, little or no composition is transferred to the substrate from the hair, skin or lips.

#### Polyamine Compound

According to the present invention, compositions comprising at least one polyamine compound are provided. In accordance with the present invention, the polyamine compound has at least two primary amine groups available to react with hydrophilic groups of the oil-soluble polar modified polymer.

According to particularly preferred embodiments, the polyamine compound is a polyalkyleneimine, preferably a C2-C5 polyalkyleneamine compound, more preferably a polyethyleneimine or polypropyleneimine. Most preferably, the polyalkyleneamine is polyethyleneimine (“PEI”). The polyalkyleneamine compound preferably has an average molecular weight range of from 500-200,000, including all ranges and subranges therebetween.

According to preferred embodiments, compositions of the present invention contain polyethyleneimine compounds in the form of branched polymers. Commercially available examples of such polymers are available from BASF under the tradename LUPASOL or POLYIMIN. Non-limiting examples of such polyethyleneimines include Lupasol® PS, Lupasol® PL, Lupasol® PR8515, Lupasol® G20, Lupasol® G35.

According to other embodiments of the present invention, polyamines such as polyethyleneimines and polypropyleneimines can be in the form of dendrimers. Non-limiting

examples of such dendrimers are manufactured by the company DSM, and/or are disclosed in U.S. Pat. No. 5,530,092 and U.S. Pat. No. 5,610,268, the contents of which are hereby incorporated by reference. Commercially available examples of such polymers include polyamidoamine or polypropyleneimine polymers from DENDRITECH sold under the STARBURST® name.

According to other embodiments of the present invention, derivatives of polyalkyleneamines are suitable polyamines. Such derivatives include, but are not limited to, alkylated derivatives, the addition products of alkylcarboxylic acids to polyalkyleneamines, the addition products of ketones and of aldehydes to polyalkyleneamines, the addition products of isocyanates and of isothiocyanates to polyalkyleneamines, the addition products of alkylene oxide or of polyalkylene oxide block polymers to polyalkyleneamines, quaternized derivatives of polyalkyleneamines, the addition products of a silicone to polyalkyleneamines, and copolymers of dicarboxylic acid and polyalkyleneamines. Even further suitable polymers include, but are not limited to, polyvinylimidazoles (homopolymers or copolymers), polyvinylpyridines (homopolymers or copolymers), compounds comprising vinylimidazole monomers (see, for example, U.S. Pat. No. 5,677,384, hereby incorporated by reference), and polymers based on amino acids containing a basic side chain (preferably selected from proteins and peptides comprising at least 5%, preferably at least 10% of amino acids selected from histidine, lysine and arginine). Such suitable polyamines as described above include those disclosed and described in U.S. Pat. No. 6,162,448, the contents of which are hereby incorporated by reference. Commercially available examples of such polymers include polyvinylamine/formamide such as those sold under the Lupamine® name by BASF, chitosan from vegetable origin such as those sold under the Kiosmetine® or Kitozyme® names, or copolymer 845 sold by ISP.

According to preferred embodiments, the at least one polyamine compound is present in the composition of the present invention in an amount ranging from about 0.1 to about 10% by weight, more preferably from about 0.2 to about 5% by weight, based on the total weight of the composition, including all ranges and subranges within these ranges.

Preferably, the amount of polyamine compound reacted with the oil-soluble polar modified polymer is such that at least two amine groups on the polyamine compound react with the oil-soluble polar modified polymer to form links or bonds between the amine groups and the hydrophilic groups of the oil-soluble polar modified polymer. The appropriate amount of polyamine compound to react with the oil-soluble polar modified polymer to obtain a reaction product can be easily determined, taking into account the number/amount of reactive amine groups on the polyamine compound and the number/amount of corresponding reactive groups on the oil-soluble polar modified polymer (for example, maleic anhydride groups). According to preferred embodiments, excess oil-soluble polar modified polymer (as determined by the relative number/amount of corresponding reactive groups on the polymer as compared to the reactive amine groups on the polyamine) is reacted with polyamine. Preferably, the polyamine to oil-soluble polar modified ratio is between 0.005 and 1, preferably between 0.006 and 0.5, and preferably between 0.007 and 0.1, including all ranges and subranges therebetween.

#### Oil-Soluble Polar Modified Polymer

According to the present invention, compositions comprising at least one oil-soluble polar modified polymer are provided. "Polar modified polymer" as used herein refers to a hydrophobic homopolymer or copolymer which has been

modified with hydrophilic unit(s). "Oil-soluble" as used herein means that the polar modified polymer is soluble in oil.

Suitable monomers for the hydrophobic homopolymers and/or copolymers include, but are not limited to, cyclic, linear or branched, substituted or unsubstituted, C2-C20 compounds such as, for example, styrene, ethylene, propylene, isopropylene, butylene, isobutylene, pentene, isopentene, isoprene, hexene, isohexene, decene, isodecene, and octadecene, including all ranges and subranges therebetween. Preferably, the monomers are C2-C8 compounds, more preferably C2-C6 compounds, and most preferably C2-C4 compounds such as ethylene, propylene and butylene.

Suitable hydrophilic unit(s) include, but are not limited to, maleic anhydride, acrylates, alkyl acrylates such as, for example, methyl acrylate, ethyl acrylate, propyl acrylate, and butyl acrylate, and polyvinylpyrrolidone (PVP).

According to the present invention, the polar modified polymer is oil-soluble: that is, the polymer does not contain a sufficient amount of hydrophilic unit(s) to render the entire polymer water-soluble or oil-insoluble. According to preferred embodiments, the polar modified polymer contains the same amount of hydrophobic monomer as hydrophilic unit (1:1 ratio) or more hydrophobic monomer than hydrophilic unit. According to particularly preferred embodiments, the polar modified polymer contains 500 or less hydrophilic unit(s) (based on weight of the polymer), 40% or less hydrophilic unit(s), 30% or less hydrophilic unit(s), 20% or less hydrophilic unit(s), 10% or less hydrophilic unit(s), 5% or less hydrophilic unit(s), 4% or less hydrophilic unit(s), or 3% or less hydrophilic unit(s).

Preferably, the polar modified polymer has from about 0.5% to about 10% hydrophilic units, more preferably from about 1% to about 8% hydrophilic units by weight with respect to the weight of the polymer, including all ranges and subranges therebetween. Particularly preferred hydrophilically modified polymers are ethylene and/or propylene homopolymers and copolymers which have been modified with maleic anhydride units.

According to preferred embodiments of the present invention, the polar modified polymer is a wax. According to particularly preferred embodiments, the polar modified wax is made via metallocene catalysis, and includes polar groups or units as well as a hydrophobic backbone. Suitable modified waxes include those disclosed in U.S. patent application publication no. 20070031361, the entire contents of which is hereby incorporated by reference. Particularly preferred polar modified waxes are C2-C3 polar modified waxes.

In accordance with preferred embodiments of the present invention, the polar modified wax is based upon a homopolymer and/or copolymer wax of hydrophobic monomers and has a weight-average molecular weight  $M_w$  of less than or equal to 25 000 g/mol, preferably of 1000 to 22 000 g/mol and particularly preferably of 4000 to 20,000 g/mol, a number-average molecular weight  $M_n$  of less than or equal to 15 000 g/mol, preferably of 500 to 12 000 g/mol and particularly preferably of 1000 to 5000 g/mol, a molar mass distribution  $M_w/M_n$  in the range from 1.5 to 10, preferably from 1.5 to 5, particularly preferably from 1.5 to 3 and especially preferably from 2 to 2.5, which have been obtained by metallocene catalysis. Also, the polar modified wax preferably has a melting point above 75° C., more preferably above 90° C. such as, for example, a melting point between 90° C. and 160° C., preferably between 100° C. and 150° C., including all ranges and subranges therebetween.

In the case of a copolymer wax, it is preferable to have, based on the total weight of the copolymer backbone, 0.1 to 30% by weight of structural units originating from the one



monomer and 70.0 to 99.9% by weight of structural units originating from the other monomer. Such homopolymer and copolymer waxes can be made, for example, by the process described in EP 571 882, the entire contents of which is hereby incorporated by reference, using the metallocene catalysts specified therein. Suitable preparation processes include, for example, suspension polymerization, solution polymerization and gas-phase polymerization of olefins in the presence of metallocene catalysts, with polymerization in the monomers also being possible.

Polar modified waxes can be produced in a known manner from the homopolymers and copolymers described above by oxidation with oxygen-containing gases, for example air, or by graft reaction with polar monomers, for example maleic acid or acrylic acid or derivatives of these acids. The polar modification of metallocene polyolefin waxes by oxidation with air is described, for example, in EP 0 890 583 A1, and the modification by grafting is described, for example, in U.S. Pat. No. 5,998,547, the entire contents of both of which are hereby incorporated by reference in their entirety.

Acceptable polar modified waxes include, but are not limited to, homopolymers and/or copolymers of ethylene and/or propylene groups which have been modified with hydrophilic units such as, for example, maleic anhydride, acrylate, methacrylate, polyvinylpyrrolidone (PVP), etc. Preferably, the C2-C3 wax has from about 0.5% to about 10% hydrophilic units, more preferably from about 1% to about 8% hydrophilic units by weight with respect to the weight of the wax, including all ranges and subranges therebetween. Particularly preferred hydrophilically modified waxes are ethylene and/or propylene homopolymers and copolymers which have been modified with maleic anhydride units.

Particularly preferred C2-C3 polar modified waxes for use in the present invention are polypropylene and/or polyethylene-maleic anhydride modified waxes ("PEMA," "PPMA," "PEPPMA") commercially available from Clariant under the trade name LICOCARE or LICOCENE, Specific examples of such waxes include products marketed by Clariant under the LicoCare name having designations such as PP207.

Other suitable polar modified polymers include, but are not limited to A-C 573 A (ETHYLENE-MALEIC ANHYDRIDE COPOLYMER; prop Point, Mettler: 106° C.) from Honeywell, A-C 596 A (PROPYLENE-MALEIC ANHYDRIDE COPOLYMER; prop Point, Mettler: 143° C.) from Honeywell, A-C 597 (PROPYLENE-MALEIC ANHYDRIDE COPOLYMER; prop Point, Mettler: 141° C.) from Honeywell, ZeMac® copolymers (from VERTELLUS) which are 1:1 copolymers of ethylene and maleic anhydride, polyisobutylene-maleic anhydride sold under the trade name ISOBAM (from Kuraray), polyisoprene-graft-maleic anhydride sold by Sigma Aldrich, poly(maleic anhydride-octadecene) sold by Chevron Phillips Chemical Co., poly(ethylene-co-butyl acrylate-co-maleic anhydride) sold under the trade name of Lotader (e.g. 2210, 3210, 4210, and 3410 grades) by Arkema, copolymers in which the butyl acrylate is replaced by other alkyl acrylates (including methyl acrylate [grades 3430, 4404, and 4503] and ethyl acrylate [grades 6200, 8200, 3300, TX 8030, 7500, 5500, 4700, and 4720] also sold by Arkema under the Lotader name, and isobutylene maleic anhydride copolymer sold under the name ACO-5013 by ISP.

According to other embodiments of the present invention, the polar modified polymer is not a wax. In accordance with these embodiments of the present invention, the polar modified polymer is based upon a homopolymer and/or copolymer of hydrophobic monomer(s) and has a weight-average molecular weight Mw of less than or equal to 1,000,000

g/mol, preferably of 1000 to 250,000 g/mol and particularly preferably of 5,000 to 50,000 g/mol, including all ranges and subranges therebetween.

In accordance with these embodiments, the polar modified polymer can be of any form typically associated with polymers such as, for example, block copolymer, a grafted copolymer or an alternating copolymer. For example, the polar modified polymer can contain a hydrophobic backbone (such as polypropylene and/or polyethylene) onto which hydrophilic groups (such as maleic anhydride) have been attached by any means including, for example, grafting. The attached groups can have any orientation (for example, atactic, isotactic or syndiotactic along the backbone).

Preferably, the polar modified polymer(s) represent from about 1% to about 30% of the total weight of the composition, more preferably from about 3% to about 20% of the total weight of the composition, and most preferably from about 5% to about 15%, including all ranges and subranges therebetween.

#### Water

The composition of the present invention also comprises water. Preferably, sufficient water is present to solubilize the polyamine present in the composition. Water is typically present in an amount of from about 0.5% to about 50% by weight, such as from about 1% to about 40% by weight, such as from about 2% to about 30% by weight, including all ranges and subranges therebetween, all weights being based on the total weight of the composition.

#### Volatile Solvents Other than Water

The composition of the present invention also comprises at least one volatile solvent other than water. The at least one volatile solvent is preferably chosen from a volatile silicone oil or a volatile non-silicone oil.

Suitable volatile silicone oils include, but are not limited to, linear or cyclic silicone oils having a viscosity at room temperature less than or equal to 6 cSt and having from 2 to 7 silicon atoms, these silicones being optionally substituted with alkyl or alkoxy groups of 1 to 10 carbon atoms. Specific oils that may be used in the invention include octamethyltetrasiloxane, decamethylcyclopentasiloxane, dodecamethylcyclohexasiloxane, heptamethyloctyltrisiloxane, hexamethyldisiloxane, decamethyltetrasiloxane, dodecamethylpentasiloxane and their mixtures. Other volatile oils which may be used include KF 96A of 6 cSt viscosity, a commercial product from Shin Etsu having a flash point of 94° C. Preferably, the volatile silicone oils have a flash point of at least 40° C.

Non-limiting examples of volatile silicone oils are listed in Table 1 below.

TABLE 1

Compound	Flash Point (° C.)	Viscosity (cSt)
Octyltrimethicone	93	1.2
Hexyltrimethicone	79	1.2
Decamethylcyclopentasiloxane (cyclopentasiloxane or D5)	72	4.2
Octamethylcyclotetrasiloxane (cyclotetradimethylsiloxane or D4)	55	2.5
Dodecamethylcyclohexasiloxane (D6)	93	7
Decamethyltetrasiloxane (L4)	63	1.7
KF-96 A from Shin Etsu	94	6
PDMS (polydimethylsiloxane) DC 200 (1.5 cSt) from Dow Corning	56	1.5

TABLE 1-continued

Compound	Flash Point (° C.)	Viscosity (cSt)
PDMS DC 200 (2 cSt) from Dow Corning	87	2
PDMS DC 200 (3 St) from Dow Corning	102	3

Suitable volatile non-silicone oils may be selected from volatile hydrocarbon oils, alcohols, volatile esters and volatile ethers. Examples of such volatile non-silicone oils include, but are not limited to, volatile hydrocarbon oils having from 8 to 16 carbon atoms and their mixtures and in particular branched C<sub>8</sub> to C<sub>16</sub> alkanes such as C<sub>8</sub> to C<sub>16</sub> isoalkanes (also known as isoparaffins), isododecane, isodecane, isohexadecane, and for example, the oils sold under the trade names of Isopar or Permethyl, the C<sub>8</sub> to C<sub>16</sub> branched esters such as isohexyl or isodecyl neopentanoate and their mixtures. Preferably, the volatile non-silicone oils have a flash point of at least 40° C.

Non-limiting examples of volatile non-silicone oils are listed in Table 2 below.

TABLE 2

Compound	Flash Point (° C.)
Isododecane	43
Propylene glycol n-butyl ether	60
Ethyl 3-ethoxypropionate	58
Propylene glycol methylether acetate	46
Isopar L (isoparaffin C11-C13)	62
Isopar H (isoparaffin C11-C12)	56

In general, the at least one volatile solvent is present in the composition in an amount of from about 20 to about 90% by weight, such as from about 30 to about 80% by weight, and from about 35 to about 75% by weight, including all ranges and subranges therebetween, all weights being based on the total weight of the composition.

#### Reaction Product

According to preferred embodiments of the present invention, the oil-soluble polar modified polymer is reacted with the polyamine compound, in the presence of water in, at minimum, an amount sufficient to solubilize the polyamine, to form a reaction product. In accordance with the preferred embodiments, the reaction product is water-insoluble.

Although not wanting to be bound by any particular theory, it is believed that at a temperature below 100° C., the reaction of the oil-soluble polar modified polymer with the primary amine group of the polyamine opens the anhydride ring to form a half acid and half amide crosslinked product. However, at a temperature above 100° C., the reaction of the oil-soluble polar modified polymer with the primary amine group of the polyamine opens the anhydride ring to form an imide crosslinked product. The former product is preferred over the latter product. It is not necessary for all amine groups and all hydrophilic groups to react with each other to form the reaction product. Rather, it is possible that the composition may contain free polyamine and/or free oil-soluble polar modified polymer in addition to the reaction product.

Although not wanting to be bound by any particular theory, it is also believed that the polyamine(s) can be non-covalently assembled with the polar modified polymer(s) by electrostatic interaction between an amine group of the polyamine and a hydrophilic group (for example, carboxylic acid group associated with maleic anhydride groups) of the polar modi-

fied polymer to form a supramolecule. For example, with specific reference to maleic anhydride groups, in the presence of water these groups can open to form dicarboxylic acid groups which can interact with protonated primary amines of the polyamine through ionic interaction to form a polymer-polymer complex with hydrophilic core crosslinkers and a hydrophobic network that act as supramolecular capsule. If a large amount of maleic anhydride groups are present, the secondary amine groups of polyamine are also protonated and interact with alkyl carboxylates.

According to preferred embodiments, the oil-soluble polar modified polymer is in an oil carrier, and the polyamine compound is in an aqueous carrier, and the reaction occurs by combining the oil carrier and the aqueous carrier. Because the oil-soluble polar modified polymer is typically solid at room temperature, the oil carrier is preferably heated to liquefy the polymer prior to combination with the aqueous carrier. Preferably, the oil carrier is heated beyond the melting point of the oil-soluble polar modified polymer, typically up to about 80° C., 90° C. or 100° C.

Without intending to be bound by any particular theory, it is believed that the reason for this is that due to the chemical and physical reactions which take place when the oil-soluble polar modified polymer is combined with the polyamine, the subsequent reaction product that is formed is surprisingly and unexpectedly able to entrap large amounts of water molecules within its hydrophobic matrix. The resultant product is eminently capable of forming a film, is self-emulsifying, water-proof. Moreover, the product is both stable and capable of carrying various types of ingredients.

#### Non-Volatile Solvent

The cosmetic compositions of the present invention further comprise at least one non-volatile solvent capable of solubilizing the oil-soluble polar modified polymer. As used herein, the term “non-volatile” means having a flash point of greater than about 100° C. The at least one non-volatile solvent typically comprises at least one non-volatile oil.

Examples of non-volatile oils that may be used in the present invention include, but are not limited to, polar oils such as:

hydrocarbon-based plant oils with a high triglyceride content consisting of fatty acid esters of glycerol, the fatty acids of which may have varied chain lengths, these chains possibly being linear or branched, and saturated or unsaturated; these oils are especially wheat germ oil, corn oil, sunflower oil, karite butter, castor oil, sweet almond oil, macadamia oil, apricot oil, soybean oil, rapeseed oil, cottonseed oil, alfalfa oil, poppy oil, pumpkin oil, sesame seed oil, marrow oil, avocado oil, hazelnut oil, grape seed oil, blackcurrant seed oil, evening primrose oil, millet oil, barley oil, quinoa oil, olive oil, rye oil, safflower oil, candlenut oil, passion flower oil or musk rose oil; or caprylic/capric acid triglycerides, for instance those sold by the company Stearineries Dubois or those sold under the names Miglyol 810, 812 and 818 by the company Dynamit Nobel;

synthetic oils or esters of formula R<sub>5</sub>COOR<sub>6</sub> in which R<sub>5</sub> represents a linear or branched higher fatty acid residue containing from 1 to 40 carbon atoms, including from 7 to 19 carbon atoms, and R<sub>6</sub> represents a branched hydrocarbon-based chain containing from 1 to 40 carbon atoms, including from 3 to 20 carbon atoms, with R<sub>6</sub>+R<sub>7</sub>≥10, such as, for example, Purcellin oil (ceto-stearyl octanoate), isononyl isononanoate, C<sub>12</sub> to C<sub>15</sub> alkyl benzoate, isopropyl myristate, 2-ethylhexyl palmitate, and octanoates, decanoates or ricinoleates of alco-

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ols or of polyalcohols; hydroxylated esters, for instance isostearyl lactate or diisostearyl malate; and pentaerythritol esters;

synthetic ethers containing from 10 to 40 carbon atoms; C<sub>8</sub> to C<sub>26</sub> fatty alcohols, for instance oleyl alcohol; and mixtures thereof.

Further, examples of hydrocarbon oils which may be used include, but are not limited to, non-polar oils such as branched and unbranched hydrocarbons and hydrocarbon waxes including polyolefins, in particular Vaseline (petrolatum), paraffin oil, squalane, squalene, hydrogenated polyisobutene, hydrogenated polydecene, polybutene, mineral oil, pentahydrosqualene, and mixtures thereof.

The at least one non-volatile solvent for the linear polypropylene-ethylene-maleic anhydride copolymer wax is preferably present in the cosmetic composition of the invention in an amount of from about 1% to about 20% by weight, such as from about 1.5% to about 10% by weight, such as from about 2% to about 5% by weight, including all ranges and subranges therebetween, all weights being based on the total weight of the composition.

#### Oil Soluble Surfactant

If present, the oil-soluble surfactant used in the compositions of the present invention generally can be any type of surfactant that is hydrophobic enough to disperse in oil. Non-limiting examples of suitable oil soluble surfactants include, but are not necessarily limited to, Polyglyceryl fatty acids, sorbitan fatty acid esters, saponified hard oils, saponified hydrogenated fatty acid oils, long chain alcohols, long chain fatty acid alcohols, long chain fatty amines, long chain sulfates, long chain sulfonates, phospholipids, and lignins. Specific suitable oil soluble surfactants include, but are not limited to, polyglyceryl isostearate, sorbitan fatty acid esters sorbitan monolaurate, sorbitan monopalmitate, sorbitan monostearate, sorbitan tristearate, sorbitan monooleate, sorbitan trioleate, sorbitan monolaurate, sorbitan monolaurate, sorbitan monopalmitate, sorbitan monostearate, sorbitan monostearate, sorbitan tristearate, and sorbitan monooleate.

Other suitable oil soluble surfactants include, but are not necessarily limited to, saponified hard oils, which include reactions of saponifying agents like sodium, potassium, calcium, etc. hydroxides with "hard oils" like mahua, tallow, castor, Neem, and the like; saponified hydrogenated fatty acid oils (with the above saponifying agents); partially and/or fully hydrogenated oils like coconut, cottonseed, soybean, and the like; long chain alcohols including long chain linear and branched alcohols that have been ethoxylated and/or propoxylated; long chain fatty amines, including dimeric forms (where two long chain fatty amine surfactants are combined at the head groups); long chain sulfates and sulphonates; and phospholipids, lignins, and mixtures of these.

If present, the at least one oil-soluble surfactant is preferably present in the cosmetic composition of the invention in an amount of from about 0.5% to about 25% by weight, such as from about 1. % to about 20% by weight, such as from about 3% to about 10% by weight, including all ranges and subranges therebetween, all weights being based on the total weight of the composition.

#### Water Soluble Surfactant

If present, the water-soluble surfactant used in the compositions of the present invention generally can be any type of surfactant that is hydrophilic enough to disperse in water. These include nonionic, cationic, anionic, zwitterionic, and amphoteric surfactants. Particularly preferred are phosphate surfactants.

Preferably, the at least one phosphate surfactant is selected from monoalkyl phosphates, dialkyl phosphates, salts of

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monoalkyl phosphates, salts of dialkyl phosphates, and mixtures thereof. More preferably, the monoalkyl phosphates and dialkyl phosphates comprise one or more linear or branched and aliphatic and/or aromatic alkyl chains having from 8 to 22 carbon atoms. According to preferred embodiments, the phosphate surfactant(s) can be neutralized with organic or inorganic bases such as, for example, potassium hydroxide, sodium hydroxide, triethanolamine, arginine, lysine and N-methylglucamine to form the aforementioned salts.

Suitable examples of phosphate surfactants include, but are not limited to, monolauryl phosphate, such as the product sold under the name MAP 20® by Kao Chemicals, the potassium salt of dodecyl phosphate, such as the mixture of mono- and diester (predominantly diester) sold under the name Crafol AP-31® by Cognis, the octyl monoester and the octyl diester of phosphoric acid, such as the mixture sold under the name Crafol AP-20® by Cognis, the ethoxylated (7 mol. of EO) 2-butyloctanol monoester and the ethoxylated (7 mol. of EO) 2-butyloctanol diester of phosphoric acid, such as the mixture sold under the name Isofol 12 7 EO-Phosphate Ester® by Condea, the potassium or triethanolamine salts of monoalkyl (C<sub>12</sub>-C<sub>13</sub>) phosphate, such as the product sold under the references Arlatone MAP 230K-40® and Arlatone MAP 230T-60® by Uniqema, potassium lauryl phosphate, such as the product as a 40% aqueous solution sold under the name Dermalcare MAP XC99/09® by Rhodia Chimie, potassium cetyl phosphate, such as the product sold under the name Arlatone MAP160K® by Uniqema, and the mixtures of these surfactants.

If present, the at least one water-soluble surfactant is preferably present in the cosmetic composition of the invention in an amount of from about 0.5% to about 25% by weight, such as from about 1. % to about 20% by weight, such as from about 3% to about 10% by weight, including all ranges and subranges therebetween, all weights being based on the total weight of the composition.

It has been surprisingly discovered that the addition of a water soluble surfactant in the present invention improves the payoff, pickup and texture of the composition, without reducing the wear property of the composition.

#### Optional Ingredients

The composition of the present invention may also include any one, or more, optional ingredients. Examples thereof include, but are not limited to, colorants such as dyes and pigments, co-solvents (volatile and/or non-volatile), waxes, plasticizers, preservatives, fillers, active ingredients such as those used to treat skin and hair and sunscreens.

Compositions of the present invention (for example, those containing an oil-soluble surfactant) may be used for any application in which it is desirable to employ a waterproof film, capable of carrying insoluble ingredients such as, for example, pigments, and which is stable, easily spreadable, and comfortable to apply.

It has surprisingly been discovered that compositions of the present invention (for example, those containing a water-soluble surfactant) are highly transfer resistant and long wearing, with good cosmetic pickup and payoff, and possesses a unique texture and feel even in the absence of silicone resins, silicone elastomers or gelling agents.

Compositions of the present invention (for example, those containing a water-soluble surfactant) may be used for any application in which it is desirable to employ a waterproof film, capable of carrying insoluble ingredients such as, for example, pigments, and which is stable, easily spreadable, and comfortable to apply. Preferably, the composition of the present invention is employed as a foundation.

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The present invention is further described in terms of the following non-limiting examples. Unless otherwise indicated, all parts and percentages are on a weight-by-weight percentage basis.

Example 1

Transfer Resistance Foundation

Properties: creamy, soft, bouncy gel

Isododecane	53.75
isohexadecane	1.95
PP207*	6.5
DI Water	20.5
Lupasol G 35 PEI (PolyEthyleneImine) (50% SOLID/50% WATER)	4
Potassium Cetyl Phosphate	3
Simethicone	0.3
TITANIUM DIOXIDE	7.82
IRON OXIDES	1.46
IRON OXIDES	0.52
IRON OXIDES	0.2
Total	100

Example 2

Bouncy Gel Foundation

Properties: Bouncy gel

Isododecane	41.45
Isohexadecane	2.25
Dimethicone	3
PP207 (*)	6.5
METHYL METHACRYLATE CROSSPOLYMER	2
Silica	2
Potassium Cetyl Phosphate	2
Lupasol G 35 PEI (PolyEthyleneImine) (50% SOLID/50% WATER)	1.5
TITANIUM DIOXIDE	7.82
IRON OXIDES	1.46
IRON OXIDES	0.52
IRON OXIDES	0.2
Preservatives	1.8
Glycerin	3
propylene glycol	1
WATER	23.5
Total	100

Example 3

isododecane	41.7
Dimethicone	8
PP207*	6.5
Sunsphere Silica	3
METHYL METHACRYLATE CROSSPOLYMER	3
Potassium Cetyl Phosphate	2.4
TITANIUM DIOXIDE	7.82
IRON OXIDES	1.46
IRON OXIDES	0.52
IRON OXIDES	0.2
DI Water	18
Polyethyleneimine	1.1

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-continued

DISODIUM EDTA	0.20
glycerin	3.50
propylene glycol	1.00
PHENOXY-2 ETHANOL	0.50
methylparaben	0.20
CHLORPHENESIN	0.20
ETHYL PARABEN	0.2
salt	0.50

10 \*PP207 is a linear polypropylene-ethylene-maleic anhydride copolymer wax commercially available from Clariant under the tradename LICOCARE PP207 LP 3349.

Procedure

In container A, PP207 was melted in the isohexadecane and isododecane until fully dissolved. The temperature was brought to 90° C.

While maintaining the temperature, the pigment grind were added to container A until fully dissolved.

15 In separate container B, LUPASOL G 35 PEI (PolyEthyleneImine), water soluble surfactant (AMPHISOL K), Simethicone and water were mixed at room temperature;

B was added to A dropwise with a pipet at high sheer (~700 rpm);

25 Heat was maintained at 70° C.-80° C. for 20 minutes while maintaining high sheer mixing;

The mixture was cooled to room temperature while mixing.

Transfer Resistant Data

30 The compositions listed above were tested for transfer resistance following the expert panel methodology for testing. The panelists all have a piece of cloth that is 18"×6.5" and clips it into the shape of a turtleneck that measures 16" by 6.5". Panelist spreads 0.1 ml of foundation on face and waits 10 minutes. After 10 minutes, panelist pulls cloth headband up their face and removes headband. Panelist then grades cloth for amount of transfer.

Results

40 Following the expert panel method, the formulations above have higher transfer resistant properties than top long wearing, transfer resistant formulas on the market.

Example 4

Foundation

50 Properties: Bouncy gel

INCL Name	%
Isododecane	54.42
Isohexadecane	2.1
PROPYLENE MALEIC ANHYDRIDE COPOLYMER	6.5
DI Water	20
Lupasol G 35 PEI (PolyEthyleneImine) (50% SOLID/ 50% WATER)	4
POLYGLYCERYL-4 ISOSTEARATE	3
TITANIUM DIOXIDE	6.2
IRON OXIDES	2.79
IRON OXIDES	0.77
IRON OXIDES	0.22
Total	100

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## Example 5

## Foundation

INCL Name	%
Isododecane	54.42
Isohexadecane	2.1
PP207*	6.5
DI Water	20
Lupasol G 35 PEI (PolyEthyleneImine) (50% SOLID/50% WATER)	4
POLYGLYCERYL-2 TRIISOSTEARATE	3
TITANIUM DIOXIDE	6.2
IRON OXIDES	2.79
IRON OXIDES	0.77
IRON OXIDES	0.22
	100

\*PP207 is a linear polypropylene-ethylene-maleic anhydride copolymer wax commercially available from Clariant under the tradename LICOCARE PP207 LP 3349.

## Procedure

In container A, PP207 was melted in the isohexadecane and isododecane until fully dissolved. The temperature was brought to 90° C.

Add the oil soluble surfactant at 90° C.

While maintaining the temperature, the pigment grind were added to container A until fully dissolved.

In separate container B, LUPASOL G 35 PEI (PolyEthyleneImine) and water were mixed at room temperature;

B was added to A dropwise with a pipet at high sheer (~700 rpm);

Heat was maintained at 70° C.-80° C. for 20 minutes while maintaining high sheer mixing;

The mixture was cooled to room temperature while mixing.

What is claimed is:

1. An emulsion comprising:

- (a) a water-insoluble half acid and half amide crosslinked reaction product of (i) at least one polyamine with (ii) an oil-soluble polar modified polymer comprising at least one C2-C4 monomer, modified with at least one hydrophilic unit, and having a weight-average molecular weight of less than or equal to 25,000 g/mol;
- (b) water in an amount of from 0.5 to 50% by weight, based on the weight of the composition;
- (c) at least one volatile solvent other than water in an amount of from 30 to about 80% by weight, based on the weight of the composition;
- (d) at least one non-volatile solvent capable of solubilizing the oil-soluble polar modified polymer;
- (e) at least one surfactant selected from the group consisting of polyglyceryl fatty acid surfactants and phosphate surfactants; and

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(f) at least one colorant,

wherein the emulsion is made with from 0.05 to 10% by weight of the polyamine and from 3 to 20% by weight of the polar modified polymer, the percent by weight based on the weight of the composition.

2. The emulsion of claim 1, wherein the polyamine is a branched polyethyleneimine.

3. The emulsion of claim 1, wherein the non-volatile solvent is a non-volatile oil.

4. The emulsion of claim 1 wherein the composition does not contain silicone resins, silicone elastomers or gelling agents.

5. A method of making-up a keratinous substrate comprising applying onto the substrate the emulsion of claim 1.

6. An emulsion comprising:

- (a) a water-insoluble half acid and half amide crosslinked reaction product of (i) at least one polyamine with (ii) an oil-soluble polar modified polymer comprising at least one C2-C4 monomer, modified with at least one hydrophilic unit, and having a weight-average molecular weight of less than or equal to 25,000 g/mol;
  - (b) water in an amount of from 0.5 to 50% by weight, based on the weight of the composition;
  - (c) at least one volatile solvent other than water in an amount of from 30 to about 80% by weight, based on the weight of the composition;
  - (d) at least one non-volatile solvent capable of solubilizing the oil-soluble polar modified polymer the at least one non-volatile solvent being in an amount of from 30 to about 80% by weight, based on the weight of the composition; and
  - (e) at least one surfactant selected from the group consisting of polyglyceryl fatty acid surfactants and phosphate surfactants,
- wherein the emulsion is made with from 0.05 to 10% by weight of the polyamine and from 3 to 20% by weight of the polar modified polymer, the percent by weight based on the weight of the composition.

7. The emulsion of claim 6, wherein the polyamine is a branched polyethyleneimine.

8. The emulsion of claim 6, wherein the composition does not contain silicone resins, silicone elastomers or gelling agents.

9. The emulsion of claim 1, wherein the surfactant is a polyglyceryl fatty acid surfactant.

10. The emulsion of claim 9, wherein the polyglyceryl fatty acid surfactant is a polyglyceryl isostearate.

11. The emulsion of claim 1, wherein the surfactant is a monoalkyl phosphate surfactant comprising at least one alkyl chain comprising 8 to 22 carbon atoms.

12. The emulsion of claim 11, wherein the surfactant is potassium cetyl phosphate.

\* \* \* \* \*